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Indian Standard

SYNTHETIC (FUSED) MULLITE AND ALUMINA GRAINS FOR REFRACTORY INDUSTRY — SPECIFICATION

ICS 81.080

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 1999 **Price Group 1**

Ores and Raw Materials Sectional Committee, MTD 13

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Ores and Raw Materials Sectional Committee had been approved by the Metallurgical Engineering Division Council.

With the upgradation of steel technology and other process industries, there is an upsurge in the requirements of high purity refractories for critical applications. Moreover, with the rapid depletion of important naturally occuring minerals, the manufacture and supply of these critical refractories to all industries has become a constraint. With the above in view, the requirement of synthetic aggregate for manufacture of special refractories will be on increase in coming years. The following two synthetic high purity materials have been included in this standard:

a) Mullite (Sintered and fused), and

b) Alumina (Sintered and fused).

These grains are mainly synthetic materials and classified under two groups, namely, Fused Grains and Sintered Grains. However, in this standard presently only fused mullite and fused alumina are covered. The sintered grade grains would be covered after materials are commercially available with relative technical details.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical value (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SYNTHETIC (FUSED) MULLITE AND ALUMINA GRAINS FOR REFRACTORY INDUSTRY — SPECIFICATION

1 SCOPE

This standard specifies the requirements of synthetic mullite and alumina grains in fused forms used for the manufacture of shaped or unshaped refractories.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1387 : 1993	General requirements for the supply of metallurgical materials (*second revision*)
4041 : 1987	Glossary of terms relating to refractory materials

3 TERMINOLOGY

3.1 For the purpose of this standard, the definition of terms given in IS 4041 and the following definitions shall apply.

3.2 Sintered Refractory Grains

Sintered grains are produced by heat treatment at elevated temperature without actual melting of the mass and subsequently crushed and graded to get optimum grains strength, porosity and density, requisite phase and controlled grain growth.

3.3 Fused Grains

Fused grains are produced by actual melting of the mass above its melting range and cooled slowly: subsequently crushed and graded.

4 GRADES

Synthetic mullite and alumina grains in fused forms have been classified into three grades as follows:

Grade	
MF	Mullite grains (fused)
ABF	Alumina brown fused
AWF	Alumina white fused

5 SAMPLING

5.1 Lot

In any consignment, all the bags containing refractory grains of the same type and grade, manufactured by the same type and grade, manufactured by the same firm under similar conditions of production shall be grouped together to constitute a lot. The maximum mass of any lot, however, shall be limited to 25 tonnes.

5.2 Sample Size

For completing all the tests, a minimum quantity of about 50 kg is required as sample. As these grains are normally supplied in 50 kg HDPE or Polythene Lined or jute bags, the quantity mentioned below shall be selected at random from the lot on following basis:

Lot Size	*Quantity*, kg
Up to 5 tonnes	50
Over 5 tonnes up to 10 tonnes	100
Over 10 tonnes up to 25 tonnes	200

5.3 The selected quantity shall be emptied on a suitable dry surface and the material be thoroughly mixed and reduced to 50 kg by coning and quartering. This final sample shall be divided equally into three test samples by successive coning and quartering. These test samples shall be used for various tests such as grain density, and apparent porosity and chemical analysis.

It may be noted that the same sample may be used for more than one test if it is permitted by respective test methods.

5.4 All the test samples tested for various physical and chemical characteristics shall meet the corresponding requirements for acceptance of the lot.

6 CHEMICAL COMPOSITION

The chemical composition of the fused mullite and alumina shall be as given in Table 1. The method of test shall be as agreed to between the purchaser and the supplier.

Table 1 Chemical Composition of Fused Mullite and Fused Alumina Grains

(*Clause* **6**)

Sl No.	Grade Designation	Chemical Analysis (Percent)				
		Al_2O_3	SiO_2	Fe_2O_3	Na_2O	CaO
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	MF	74-78	22-26	0.30 *Max*	0.40 *Max*	—
ii)	ABF	95 *Min*	1.0 *Max*	0.2 *Max*	0.2 *Max*	0.8 *Max*
ii)	AWF	99 *Min*	0.2 *Max*	0.2 *Max*	0.3 *Max*	—

7 PHYSICAL TESTS

The physical requirements of the fused mullite and fused alumina shall be as given in Table 2. The method of tests shall be mutually agreed to between the purchaser and the supplier.

8 PARTICLE SIZE

Fused mullite and alumina grains shall be supplied in size as mutually agreed to between the purchaser and the supplier.

Table 2 Physical Properties of Fused Mullite and Fused Alumina Grains

(*Clause* **7**)

Sl No.	Grade Designation	Grain Density g/cc (*Min*)	Apparent Porosity Percent (*Max*)
(1)	(2)	(3)	(4)
i)	MF	2.85	1.0
ii)	ABF	3.35	1.0
iii)	AWF	3.50	1.0

9 PACKING

Material shall be supplied in polythene lined or HDPE bags containing 50 kg.

10 MARKING

The packing containing the material shall be marked with the following:

a) Manufacturer's name,
b) Type/grade or refractory grains, and
c) Net weight.

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